Obstructive Sleep Apnea Diagnosis and Treatment

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Ventilation during NREM Sleep

- Decrease ventilatory motor neuron output leading to decease in tidal volume and minute ventilation
- Upper airway dilatory muscles relaxation leading to reduced luminal caliper and increasing resistance.
- Increase in Paco2 and decreasing in Pao2.
- **breathing becomes more dependant on central chemoresponsiveness

Upper-Airway Changes During Sleep

- Reduced muscle activity of upper airway dilators.
- Reduced upper-airway caliber.
- Increase airway resistance.
- Increase pharyngeal collapsibility.
- LEADING TO REDUCED TIDAL VOLUME & HYPOVENTILATION

In summary

- Upper-airway resistance increases during sleep.
- Hypoventilation is a universal finding during sleep caused by upper-airway resistance and decrease central ventilatory motor output.
- Ventilation during NREM sleep is critically dependent on chemical stimuli-$PaCO_2/PaO_2$

Types of sleep disordered breathing syndromes

- Obstructive (80%)
- OSA
- ARS
- Central (10-15%)
- Hypocapnic

CSR-CSA, high altitude

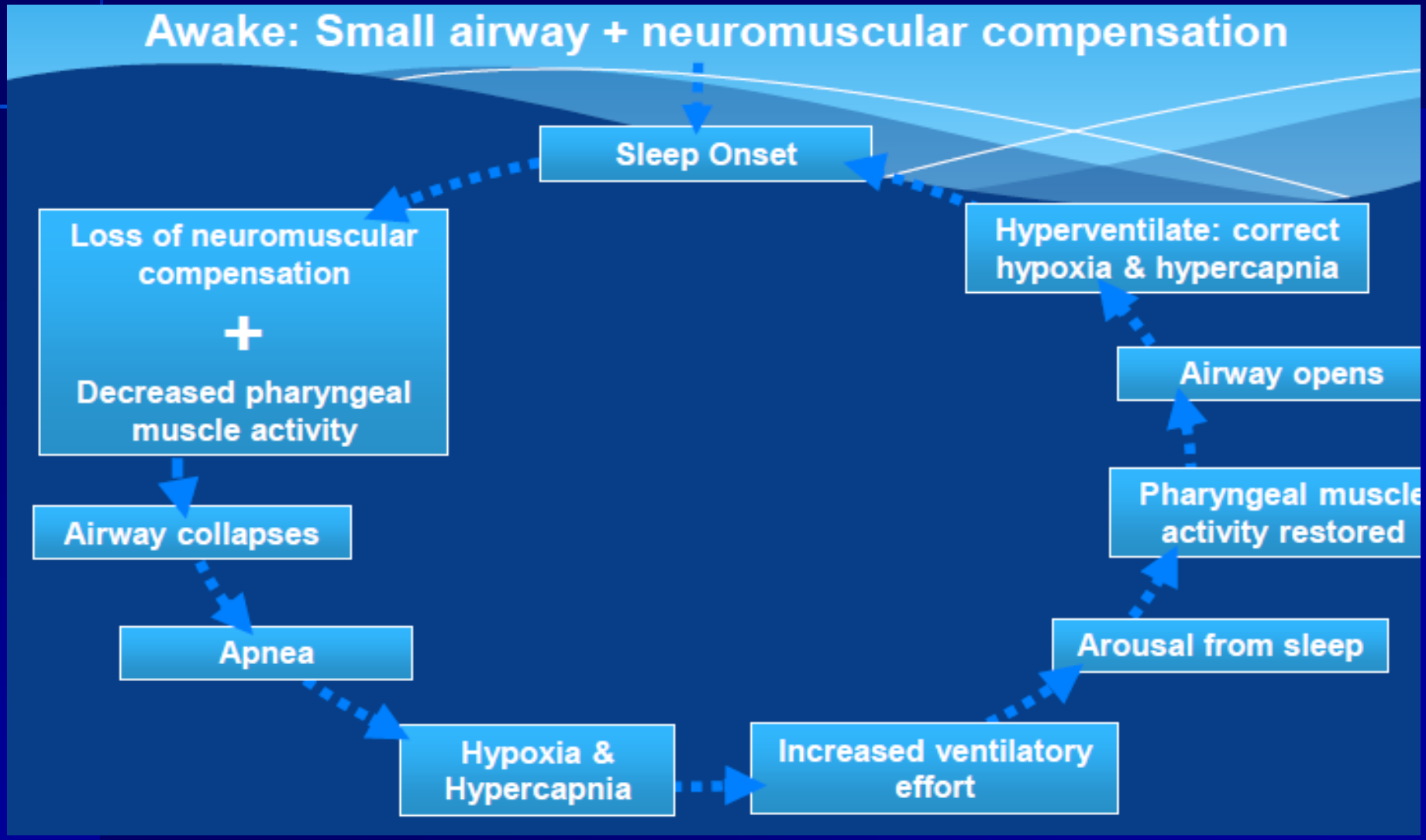
- Hypercapnic

Pontine lesions, RCB

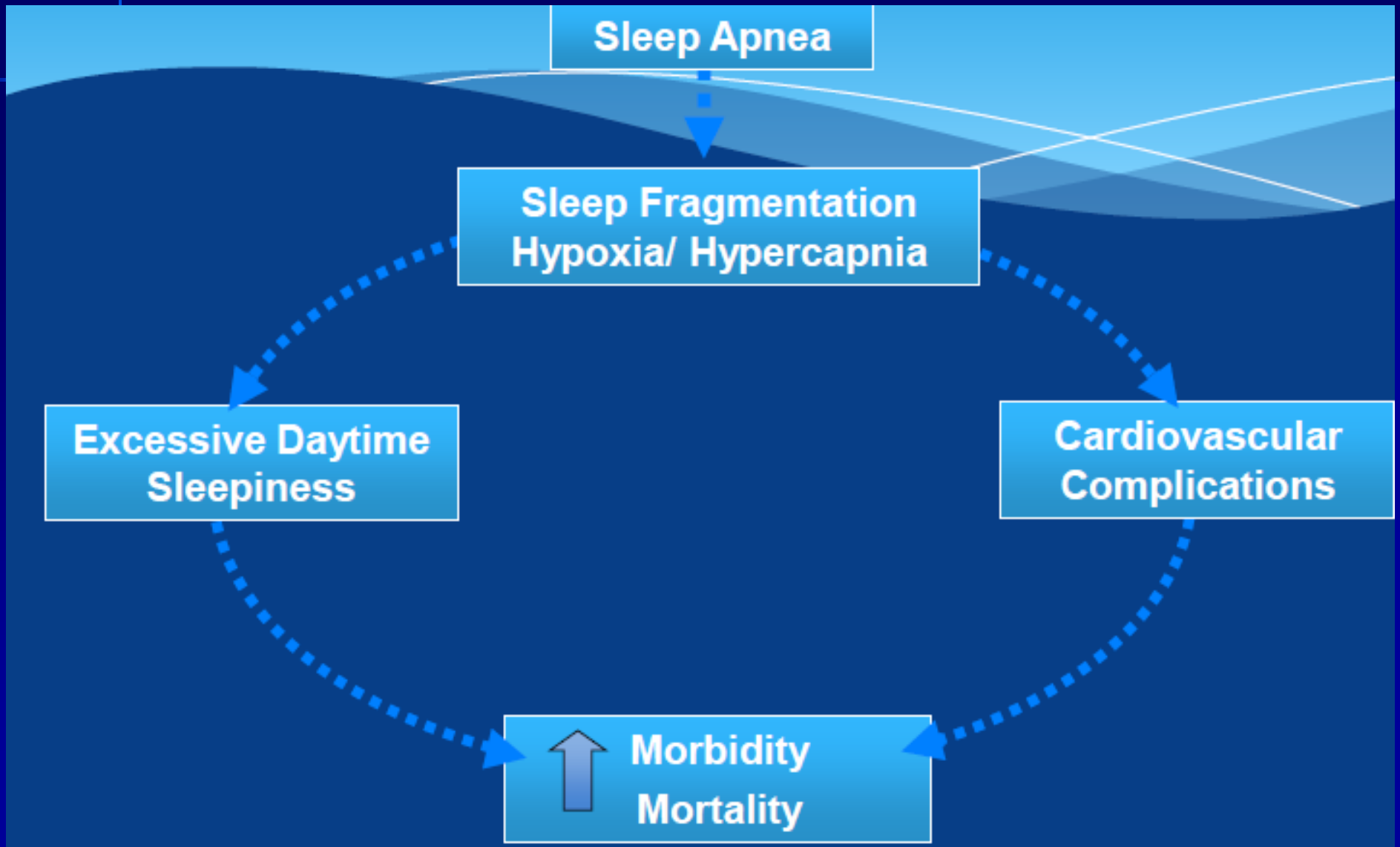
Obstructive sleep apnea, Adult

- Repetitive episodes of complete (apnea) or partial (hypopnea) upper airway obstruction occurring during sleep lasting 10 seconds or longer.
- Events often result in
- Decrease SaO2
- Termination of event with arousal

Pathophysiology of Sleep Apnea



Clinical Consequences



Consequences: Excessive Daytime Sleepiness

- Increased motor vehicle crashes
- Increased work-related accidents
- Poor job performance
- Depression
- Family discord
- Decreased quality of life

Consequences: Cardiovascular

- Systemic hypertension
- Cardiac arrhythmias
- Myocardial ischemia
- Cerebrovascular disease
- Pulmonary hypertension / cor pulmonale

Mechanisms of CV dysfunction in OSA

- Arousals and/or hypoxemia
  - Sympathetic hyperactivity
  - Increased catecholamine's
  - Increased adhesion molecule activity
  - Endothelial injury
  - Suppressed circulating nitric oxide
  - Exaggerated vasopressor responses
  - Insulin resistance
- All improved by treatment of OSA

Consequences: Pulmonary hypertension

- Prevalence10-30% if pulmonary function is normal73% if airflow obstruction present
- Pathogenisis
  - Mechanical factors
  - Hypoxia
- Improves with NCPAP and tracheostomy, not with O2

Sleep Apnea Risk Factors

- Obesity
- Increasing age
- Male gender
- Anatomic abnormalities of upper airway
- Family history
- Alcohol or sedative use
- Smoking
- Associated conditions

Risk Factor: Associated Conditions

- Hypothyroidism
- Acromegaly
- Amyloidosis
- Vocal cord paralysis
- Marfan syndrome
- Down syndrome
- Neuromuscular disorders

Diagnosis: History

- Snoring (loud, chronic)
- Nocturnal gasping and choking
- Ask bed partner (witnessed apneas)
- Automobile or work related accidents
- Personality changes or cognitive problems
- Risk factors
- Excessive daytime sleepiness

Diagnosis: Assessing Daytime Sleepiness

- Often unrecognized by patient
- Ask family members
- Must ask specific questions
- Fatigue vs. sleepiness
- Auto crashes or near misses
- Sleep in inappropriate settings
  - Work
  - Social situation

Diagnosis: Physical Examination

- Upper body obesity / thick neck
  - > 17-18” males
  - > 16” females
- Hypertension
- Obvious airway abnormality

What Test Should be Used?

- In-laboratory full night polysomnography
- Split night studies
- Home diagnostic systems
- Oximetry to full polysomnography

Diagnostic Conclusions

- Signs and symptoms
  - Excessive daytime sleepiness
  - Hypertension and other cardiovascular outcomes.
- Sleep study results
  - Apnea / hypopnea frequency
  - Sleep fragmentation
  - Oxyhemoglobin desaturation

Why treat OSA?

- Improve bed partners sleep
- Improve patients sleep
- Alleviate daytime sleepiness
- Reverse cognitive impairment
- Improve diurnal blood pressure
- Minimize cardiovascular risk
- Reverse pulmonary hypertension and/or hypercapnia

Therapeutic Approach

- Risk counseling
  - Motor vehicle crashes
  - Job-related hazards
  - Judgment impairment
- OSA and comorbidity treatment
  - Behavioral
  - Medical
  - Surgical

Treatment of obstructive sleep disordered breathing

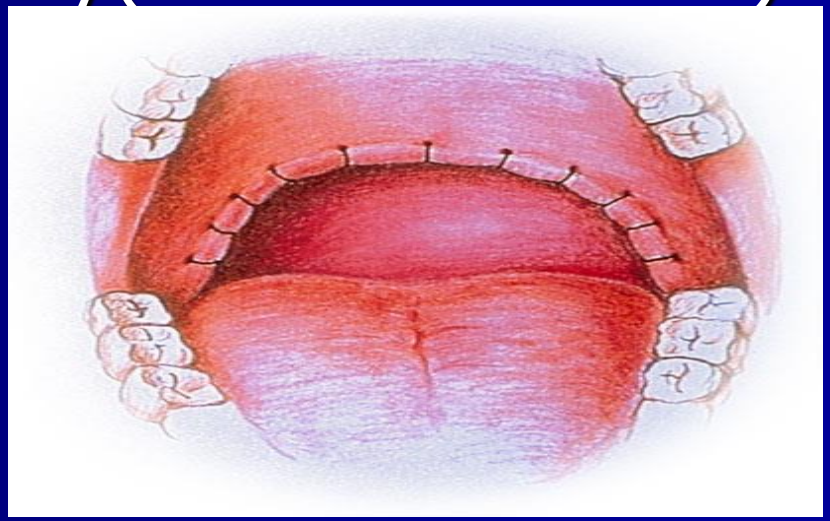
- Behavioral
  - Weight loss
  - Postural therapy
  - Avoid ethanol and tobacco
- Mechanical
  - Positive airway pressure
  - Oral appliance
- Surgical

Treatment of obstructive sleep disordered breathing

- Positive airway pressure
- Continuous positive airway pressure (CPAP)
- Bi-level positive airway pressure (BiPAP or Bi-level PAP)
- Self adjusting positive airway pressure
- Expiratory pressure release
- Oral appliances
- Other (limited role)
- Medications ,Oxygen

Surgical treatment

- correct cause of obstruction
- Mandibular advancement surgery(alternative for positive airway pressure)
- Uvulopalatopharyngoplasty(not so effective)



THANK YOU!!!